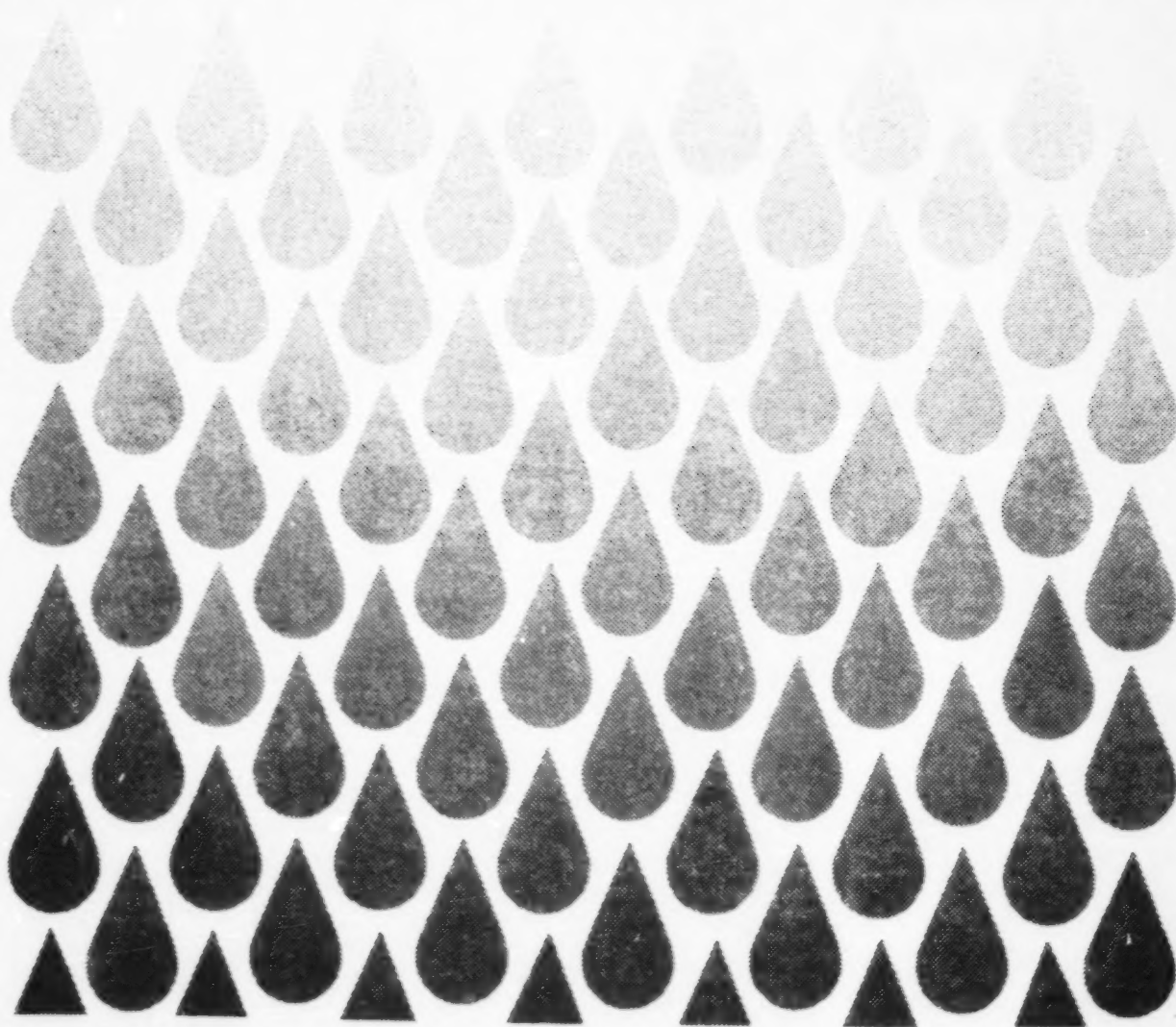


MINISTER'S TASK FORCE
ON CLEAN WATER

FINAL REPORT AND
RECOMMENDATIONS

for **Clean Water**
Nova Scotia

New Directions For Water Resource Management



**Department of
the Environment**

Honourable John G. Leefe
Minister of the Environment

**HALIFAX, NOVA SCOTIA
JUNE, 1991**



**Department of
the Environment**

PO Box 2107
Halifax, Nova Scotia
B3J 3B7

Our file no:

Hon. John G. Leefe, Minister
Nova Scotia Department of the Environment
Halifax, Nova Scotia

Dear Mr. Leefe:

Re: Minister's Task Force on Clean Water - Final Report

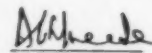
The Task Force is pleased to report that Nova Scotians have responded well and with great interest to the mandate you gave us.

The comments received from the public, municipalities, federal and provincial departments and agencies with interests in a such a complex subject as water, were thoughtful and stimulating and represented considerable time and effort on the part of the participants. This was appreciated by the Task Force members in its development of the recommendations for a comprehensive Provincial Water Resource Management Strategy.

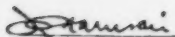
The Task Force is very pleased and unanimous in presenting its Final Report with Recommendations for your consideration. The members would also be pleased to respond to questions, clarify any points and to assist in the implementation of these recommendations.

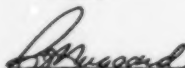
Respectfully submitted,

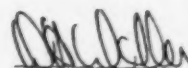

Douglas Carter
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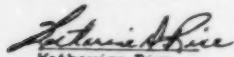

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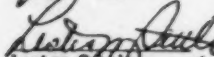
Members

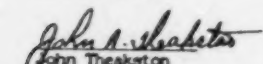

James Harrison

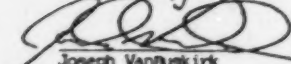

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**Department of
the Environment**

Office of the Minister



TO ALL NOVA SCOTIANS

Thank you for sharing your concerns and ideas about water issues with the Task Force in the public meetings held throughout the Province, replies to the Interim Report and the workshops completed this spring. This input over the last year and a half, has greatly assisted the Task Force to develop a most comprehensive final report and recommendations.

These new directions for "Clean Water" will go a long way to address Nova Scotians' real needs for a Provincial Water Resource Management Strategy that can be readily implemented.

The Task Force members are to be commended for the excellent quality of their report, which deals with such a diverse and complex subject as water. As I have said before, "water is a touchstone, a marker for judging our care of the planet."

I will ask my colleagues in government that the recommendations contained in this report be accepted as a Provincial Water Resource Management Strategy not only for immediate use and implementation in the 1990's, but as directions that will serve Nova Scotians well into the 21st century.

Yours sincerely,

John G. Leefe
Minister

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INTRODUCTION

TASK FORCE ON CLEAN WATER: MANDATE

In June, 1989, Honourable John Leefe, Minister of the Nova Scotia Department of the Environment, established a Task Force on Clean Water to... "develop a new Water Resource Management Strategy by reviewing and defining policies to manage surface water and groundwater resources for our use and that of future generations."

The Terms of Reference directed the Task Force to examine the following areas of water resource management:

Water Quality

- ▶ To ensure adequate water quality.
- ▶ To reduce, minimize or prevent pollution from a variety of point and non-point sources.
- ▶ To minimize the effects and damage due to long range transport of air pollutants.

Water and Land Use Planning

- ▶ To ensure adequate water quantity.
- ▶ To provide appropriate planning and land use mechanisms for use in flood prone areas and to reduce or minimize damage from storm water drainage.
- ▶ To encourage the development of municipal water supply watershed management and protection plans and mechanisms to implement them.
- ▶ To ensure provincial water resources are protected from erosion and related activities and, where possible, minimize these effects.

Socio-economic Concerns

- ▶ To manage and protect the lakes, rivers, wetlands and coastal areas of Nova Scotia so that they can continue to provide economic, aesthetic and environmental benefits.
- ▶ To provide for effective recreational fish and game environments.
- ▶ To enable socio-economic benefits to accrue to the Province from sound pricing and cost recovery for the use of its water.
- ▶ To ensure cost-effective delivery of municipal water supply and pollution control infrastructure.

Institutional Arrangements

- ▶ To clarify to Nova Scotians the role of federal, provincial and municipal jurisdiction in the management of water resources.
- ▶ To provide for more effective legislation, regulation and administration.
- ▶ To enhance the role of academic institutions in Nova Scotia in all aspects of water research and training.

Public Information and Education

- ▶ To develop positive public education and media programs for sound water resources stewardship.

THE PROCESS

The Task Force was asked to review existing information on water resources; to invite written and oral submissions from the public, industries, municipalities, federal, provincial government departments and agencies with an interest in water and examine water management initiatives from other jurisdictions across Canada.

The Minister requested that an interim report be delivered 12 months after the start of the information collection stage. This was presented to the Minister in November 1990. This final report identifies the full scope of water resource issues and problems with recommendations for action.

The Interim Report was circulated to the public for comment and suggestions based on what was heard in the province-wide public meetings. Following the replies to the Interim Report, workshops were held in March 1991 to obtain additional public input. Appendix I includes comments received from the public meetings, the Interim Report replies and the workshops.

WHAT NOVA SCOTIANS TOLD US AND WHAT THEY EXPECT

Appendix I summarizes the views of Nova Scotians on water management. Part of the public feedback was first presented in the Interim Report but has been expanded and rearranged to assist the Task Force in its analysis and development of recommendations.

This section includes over 850 issues, recommendations, and statements compiled from individuals and groups. Over 1900 pages of information have been sorted, condensed and classified into a series of key issues/problems and suggestions/solutions given by the public.

They resulted from briefing sessions with representatives of government departments, fourteen public meetings held throughout the province, Interim Report questionnaire replies and the workshops held March 1991.

Organization of Report

- ▶ Part I of this report summarizes the existing situation about water quality, quantity and management in Nova Scotia.
- ▶ Part II presents the Task Force's Principles, Goals and Recommendations for Implementation.

PART I: STATE OF THE RESOURCE - THE CURRENT SITUATION

OVERVIEW

Nova Scotians use water at home, in businesses and industries, and for recreation. The average household uses 150 to 250 gallons of water per day. Only 4 percent is consumed by drinking or cooking; 96 percent is used for all types of waste disposal.

AVERAGE HOUSEHOLD WATER USE

Bathing and personal use	28%
Laundry and dishes	23%
Toilet	45%
Drinking and cooking	4%

Source - Our Fresh Water Resources, Environment Canada, Inland Waters Directorate, 1982.

Most of us take water for granted and waste it at home and in industrial processes. This reflects the general tendency to consider water as a cheap, readily available resource. Water is usually forgotten until the supply is reduced or cut off due to shortage or contamination.

AVERAGE DAILY WATER CONSUMPTION IN NOVA SCOTIA

User:	Amount (gals/day):
Municipal Water Systems	75,600,000
Individual Wells	30,000,000

Industrial Uses:

Pulp and Paper	85,000,000
Mining and Manufacturing	8,400,000
Fish Processing	850,000
Meat Packing	840,000
Dairy and Beverages	320,000

Agricultural Uses:

Stock Watering	1,900,000
Irrigation (3 applications/year)	600,000

Total Daily Water Consumption 191,500,000

Source: Nova Scotia Department of the Environment, Water Resource Services, October 1990.

The water we use comes from two main sources. About 51 percent of it is drawn from lakes and streams that are part of our surface water resource; the remaining 49 percent is pumped from wells tapping the groundwater resource. There are 81 municipal water supplies in the province providing domestic water to over 60 percent of the population. Fifty-six of these use surface water and 25 use groundwater. About 320,000 Nova Scotians use individual wells for their daily water requirements.

There are 35 licensed industrial users of surface water supplies in Nova Scotia and 9 licensed industrial users of groundwater systems.

There are over 6,700 lakes in Nova Scotia plus many rivers, and significant groundwater resources. So why should Nova Scotians worry about the future of fresh water in the province? There are five main reasons:

- ▶ The natural quality of water in some areas of the province is unsuitable for human consumption. It is often degraded further by man-made contaminants.
- ▶ There is a conflicting approach to water management because of incomplete knowledge of the cleansing capacity of natural aquatic systems and an over-reliance on them to dispose of our wastes. This results in the destruction or degradation of wetlands because of incomplete knowledge of the importance of natural mechanisms to absorb contaminants.
- ▶ The management of water is fragmented, incomplete and lacks coordination. At present it is not managed as a resource.
- ▶ It is expensive to clean up pollution after the fact. Governments at all levels (federal, provincial and municipal) have limited funds to spend on infrastructure. Costs could be reduced or avoided through better planning, management and conservation.

- Nova Scotians are generally ill informed about the value of water and its importance for use by all sectors in the provincial economy, including wildlife, recreation and tourism, and hence are not fully participating in the stewardship of this resource.
-

WATER QUALITY

In nature, there is no pure water. Most of the water in Nova Scotia, on the surface and in the ground, contains dissolved minerals and some contaminants that may reduce its quality. Some of this water may be unsuitable for drinking without treatment.

Some contaminants occur naturally. They come from bogs and swamps, soil, and rocks on the earth's surface and underground. They include iron and manganese which add colour and affect the taste and hydrogen sulphide which gives an unpleasant smell. Arsenic can be poisonous, and radioactive minerals (uranium and radon) may be a health hazard in certain concentrations.

Water is also affected and degraded by human activities. It is polluted by acid rain, sewage, animal manure, industrial liquid wastes, road salt, chemical products, and silt from land clearing and construction activities. Degradation also occurs through the destruction of wetlands because of infilling, reclamation as farmland, and other developments such as subdivisions for homes and cottages.

In Nova Scotia our water supplies are affected by a combination of human and natural contaminants. Forty-eight of the surface water supplies and 19 of the groundwater supplies have quality problems. Another 16 periodically experience shortages of water.

Many contaminants come from clearly identified sources, called point sources, but others are generated in small amounts from several undetermined locations that are called non-point pollution sources. Non-point sources are more difficult to deal with because there may be hundreds of individual contributions to one general problem.

Many sources of contamination can be traced to land use activities such as construction, forestry, agriculture and mining. However, the contribution from industry, municipal sewage systems and individual on-site sewage systems is significant. It is also important to note the contribution of chemicals from residential home use, particularly lawn and garden sprays, and from recreational activities such as power boating.

NATURAL WATER SYSTEMS

It is often assumed that surface and ground-water systems can cope with pollutants and will regenerate naturally to yield clean water. However, in some parts of the province the amount of pollution has exceeded natural purification mechanisms.

One of the most serious problems comes from sewage disposal systems. The Annapolis River is a good example of an overloaded waterway, but there are other rivers and estuaries around the province which are of concern. In addition, some chemicals are being discharged which do not degrade naturally but collect in bottom sediments, aquatic plants and animals. Heavy metals and some chemicals discharged from industries and effluent from waste disposal sites are also problems.

There is little information about the capability of natural waterways to absorb contaminants, yet these continue to be loaded with different types of waste. In general, the low water conditions during summer in many provincial water courses, and slow replacement rate of lakes suggest they have limited ability to assimilate pollutants. Groundwater systems are difficult to analyze, because we cannot see what is happening, but are known to be vulnerable to long term or even permanent contamination under some circumstances - for instance, where there are leaking petroleum storage tanks, chemical and hazardous waste spills.

For surface waters, the problem is compounded by the destruction of wetlands which provide the main mechanism for natural purification of water. The productive plant and animal life of the wetlands withdraw nutrients

from water contributed by sewage effluent, other organic liquid effluents and chemical fertilizers. They also extract some metals and filter out silt.

Wetlands are critically important in the ecological cycle that supports wildlife populations. They provide protection, feeding and rearing areas for many animal and plant species and are an integral part of the support system for the rich and diverse wildlife and plants of Nova Scotia.

The main contributor to wetland destruction has been infilling for development. This has occurred throughout the province but has been particularly common on flood plains which are popular places to build because the land is flat and the soil is deep. In these locations another problem arises. The natural function of the flood plain, to receive and store flood water, has been ignored and the inevitable periodic inundations have caused considerable property damage. To avoid flooding, developers have often built up the land with fill to raise the level of property. This reduces the area available to contain flood water and can lead to increased upstream and downstream flood damage.

Interference with natural water flow patterns can also reduce the storage available for water in periods of high rainfall. This may result in water not being available for use in extended dry periods. Water imbalances can also be caused by the destruction of wetlands and the removal of vegetation. Wetlands and vegetation retain water and recharge groundwater resources.

Overpumping of the groundwater resource can cause reduced well yields and low water levels with increased pumping costs. Interference among water wells can also decrease the natural groundwater discharge to rivers and streams during drought periods affecting water supplies, wildlife, recreational and other uses.

Surface water and groundwater systems must be better understood, protected from contamination with their natural buffering and cleansing capacities, and maintained. Storm water and flood plain management must have a higher priority if future property damage is to be reduced.

MANAGEMENT OF WATER RESOURCES

The surface and groundwater resources are owned by the Province, and the Water Act is now administered by the Nova Scotia Department of the Environment. The overall responsibility for management is actually fragmented among several provincial departments, - including Environment, Fisheries, Health and Fitness, Lands and Forests and Municipal Affairs - all with some direct legislative role. Others, including the departments of Agriculture and Marketing, Mines and Energy, Transportation and Communications, Board of Commissioners of Public Utilities and Industry, Trade and Technology, affect water through the administration of regulations.

The federal government has an interest in various aspects of water management, including the protection of fish habitat, navigation, research and data collection, flood damage reduction, conservation and general environmental stewardship. Municipalities are responsible for their own water supplies, stormwater, and sewage collection and treatment. They also have a significant influence over the quality of fresh water through the control of land use, but have no formal role or responsibility for water management.

Responsibilities for the water resource are divided and poorly coordinated, even though they are basic to the health of Nova Scotians and to the economy of the province. Water management, in the short term, has been reduced to solving specific problems rather than managing and protecting the resource for the long term.

This fractured responsibility has led some local groups to set up watershed advisory groups to work between the different departments and levels of government. These groups have no authority to act in this role and their important work has not been fully recognized.

One area of particular concern is the management of watersheds that provide municipal drinking water. The activities on the land within these watersheds can directly affect the quality of water and the cost of treatment. It is important to prevent activities taking place which could pollute the water supply and affect public health. In most cases the muni-

cipalities drawing the water have little control over the watershed lands which are often located in another municipality. As a result the water may suffer from various forms of contamination due to land use activities incompatible with the production of safe drinking water.

Another problem is the allocation of water resources among users who have different needs and different impacts on the water. For instance, hydro development and sport fishing interests view water from very different perspectives. At present there is no way to ensure that the legitimate needs of all parties are examined and considered during the review of permit applications, because of the lack of clear water resource management objectives.

Better mechanisms are required to deal with conflicting demands on water quality and quantity. Resolution of these management problems requires a new direction. This points to the need for a broader watershed-based perspective to be adopted. Greater coordination and cooperation among those responsible for management of the resource is required.

ECONOMIC FACTORS

One of the more significant costs municipalities have is the provision of water and sewage services for their residents. Often, the quality of treated water for drinking has been inadequate for the consumer. The treatment of waste water has often been ineffective in controlling pollution.

About half of the provincial population is served by municipal water supplies. In many communities the water is not metered, thereby encouraging waste; the charge for the water service to the consumer is often below utility costs. In addition some municipalities supply water that meets basic health standards but may be coloured, have odour or an unpleasant taste. Some water supplies are subject to periodic "boil orders" when bacterial counts become unacceptable.

Similarly, sewage treatment is often inadequate, outdated or even absent, in which

case the effluent frequently contaminates both fresh water and coastal waters where it may degrade potential shellfish areas.

The Task Force has learned that in some municipalities, water and sewage services were installed after well water became contaminated by inadequate on-site septic disposal systems. Some of these problems could have been avoided by better planning. Others are the legacy of poorly controlled development practices in the decades up to and including the 1970's. In some cases the groundwater quality and/or quantity was inadequate to begin with and a more reliable supply was needed.

In the past there has been lack of cooperation between and among municipalities over servicing. These costs might have been reduced and better systems installed through joint initiatives. The existing uncoordinated and uncooperative approach to water supply and wastewater management has been expensive for the Province and municipalities. This offers little comfort for the conservation of our fresh water resources and the protection of the estuarine environment for the future. A new management approach is required for the 1990's and beyond.

EDUCATION AND INFORMATION

Formal and non-formal education surfaced as issues in the Task Force consultation sessions. There is a general sense that better, or increased, information would be a major step towards resolution of some current water problems and would ward off difficulties in the future.

Members of the public told the Task Force of their difficulties in gaining access to appropriate sources of information. Some blamed the public school system, in that it does not educate and prepare society to conserve and protect water. Others considered the onus should rest with the different levels of government, the individuals themselves and the media.

Education and the access to information on water management must be more effective if priorities for water resource management are

to be understood and supported by the public.

RESEARCH, DATA AND MONITORING

In order to plan for our future water needs, it is critical to develop a sound basis of information that is comprehensive and accessible. This data base should provide information on the quantity and quality of surface water and groundwater throughout the province, track emerging and potential problems, and provide information on the response of natural water systems to pollutant loading.

At present, data are being collected by a number of government agencies and research institutions. This information is often not easy to access either as raw or interpreted information. It is therefore not readily available to the individuals engaged in water planning and management.

Overall, water management is only as good as the tools available to carry it out and foremost among these is a comprehensive and fully accessible data base. While conscientious water managers always want more information, their basic requirements must be met to achieve the kind of effective resource management Nova Scotians expect and need.

EMERGING CONCERNS

1. Climate Change

An example of the work that needs to be done is the monitoring of the effect of atmospheric changes on water resources. The impact is difficult to predict at present because the relationship between the changes in the composition of the earth's atmosphere and climate at this latitude are not well understood. However, some possible implications are more frequent drought events, changes in the water table, changing water levels in lakes, more severe storm and flood events, sea level rise, and salt water intrusion into coastal aquifers. These could also affect the engineering, design and construction of new structures and the provision of remedial or

protective measures for existing structures in coastal areas.

2. Export of Water

In some parts of the world the demand for quality water is exceeding the locally available supply. Increasingly, Canada is being regarded as an important source of water for other countries and the number of applications to export water is growing. So far, Nova Scotia has not been the main focus of interest for export proposals, but this could change. At present the province is ill-prepared to handle that eventuality. The existing data base would make it difficult to assess such applications, and there are no mechanisms in place to apportion water among different users, including exporters.

PART II: NEW DIRECTIONS FOR CLEAN WATER TASK FORCE RECOMMENDATIONS

INTRODUCTION

In Part II the Task Force presents its assessment of the requirements for water resource management in Nova Scotia. The principles and recommendations draw extensively on the views of Nova Scotians but also reflect the analysis and conclusions of the Task Force itself. The recommendations establish a framework which will ensure that water is managed as a resource rather than a commodity. This will integrate economic development and environmental protection objectives.

The new approach requires a fundamental reassignment of responsibilities in water management through the establishment of a coordinating **LEAD AGENCY**. This requires a clearly defined mandate, the active participation of all three levels of government and each of the provincial departments involved in water resource management. A consultative approach involving water managers, water

users, the public, and new or amended legislation is also needed.

The legislation should include a new **WATER RESOURCE ACT** to replace the existing Water Act, the development and implementation of integrated water and land use policies, changes to the Planning Act, and amendments to other legislation. These should be consistent with the principles, goals, management objectives and recommendations for implementation contained in this report.

The Task Force appreciates the interest and involvement of all participants in the public meetings, workshops, replies to the Interim Report, and particularly the time and degree of detail and thought that went into the submissions received. The public input, as summarized in Appendix I, provided the basis for the recommendations developed by the Task Force.

PRINCIPLES FOR WATER RESOURCE MANAGEMENT

- Water is a valuable renewable resource that must be protected and managed effectively to provide economic and environmental benefits to Nova Scotians.
- The responsibility for water resource management rests primarily with the Province, but must be shared by all Nova Scotians through their participation and stewardship.
- The Province must recognize the need for a **LEAD AGENCY** with a strong mandate, accountability and responsibility for water resource management and coordination in Nova Scotia.
- Effective and sustainable management of the water resource must be based on water use objectives and standards, and integrated with water and land use management.
- Education, information, and public involvement are fundamental to, and a necessary component of, good water resource management.

GOALS FOR WATER RESOURCE MANAGEMENT

- To ensure water quality meets the needs of all water users now and in the future;
 - To assure the provision of safe, adequate and reliable water supplies for individual, municipal, industrial and agricultural uses;
 - To prevent damage to life and property from storm and flood waters;
 - To protect wetlands and other watercourses;
 - To protect habitat and water quality for animals and plants;
 - To ensure the health of aquatic ecosystems;
 - To ensure that the water resource continues to provide recreational benefits;
 - To ensure that water is valued appropriately and used efficiently;
 - To allocate water resources among competing uses in a manner that will achieve the greatest societal value;
 - To ensure informed public participation in water resource management.
-

RECOMMENDATIONS FOR IMPLEMENTATION

1.0 PRINCIPLES AND GOALS

1.1 The Province should formally adopt the foregoing Principles and Goals as the foundation for water resource management in Nova Scotia.

2.0 INSTITUTIONAL ARRANGEMENTS

Introduction:

A comprehensive review of the many tools of water management will be needed before integrated water management can be fully implemented. However, the following outline provides the basic framework for new institutional arrangements. Five key management requirements are clearly identifiable:

- Management Objectives;
- A strong and well defined role and mandate for the **LEAD AGENCY**;
- A new Water Resource Act;
- A Water Resource Advisory Council;
- Integrated provincial policies on water and land use.

2.1 Management Objectives

The review and development or amendment of legislation, regulations, guidelines and programs should reflect the Principles and Goals and be based on the following Management Objectives:

- ▶ Coordination of the management of water with that of other resources;
- ▶ Integration of the responsibilities of all provincial departments with interests or mandates related to water;
- ▶ Incorporation of the functions in management of data collection, resource evaluation, monitoring, planning, resource allocation, regulation, communications, and research;
- ▶ Development of policies that recognize the concerns, jurisdictions, responsibilities, interests and involvement of the municipal and federal governments;
- ▶ Integration of water resource and land use planning with the management of land use activities;
- ▶ Recognition of the basic hydrologic relationships among surface water, groundwater and estuaries (freshwater & saltwater interface);
- ▶ Recognition that the quality of municipal water supplies depends on the protection of the raw water within watersheds and aquifers.

2.2 LEAD AGENCY

The Province should designate a single LEAD AGENCY to:

- ▶ *manage and regulate the resource*
- ▶ *coordinate the activities of all other agencies, at all three levels of government, with interests and mandates related to water resource management.*

This **LEAD AGENCY** could be established within an existing provincial department provided it is given the mandate and resources. The role of the **LEAD AGENCY** would be:

- ▶ To manage water quality and quantity for the full range of domestic, commercial, industrial, recreational and wildlife interests;
- ▶ To establish priorities and principles for servicing, treatment and conservation;
- ▶ To develop, regulate and enforce water resource legislation.

The construction and operation of provincial utilities should not be carried out by the **LEAD AGENCY**. These functions should be the responsibility of other provincial departments, agencies or the private sector. The approval of utility rates will continue to remain with the Commissioners of the Board of Public Utilities.

The key responsibilities of the Agency should be to undertake research, collect data, monitor, plan, set objectives, develop and adopt guidelines, standards and regulations; provide information and co-ordinate other levels of government, provincial departments and the public. It may undertake to do this on a regional basis using the watershed for planning and management decisions. It would also manage the provincial cost sharing of municipal water and wastewater servicing infrastructure as part of its integrated role.

2.3 Water Resource Council

The Province should establish a WATER RESOURCE COUNCIL to advise the Minister and provide public input to decision making.

The Council membership should include a broad representation of interests from citizens' groups, professionals (health, legal, engineers and scientists), educators, resource users (agriculture, forestry, fisheries)

industry, municipalities, watershed advisory, environmental and wildlife groups, among others.

2.4 Water Resource Act

The Province should develop and enact a comprehensive Water Resource Act to replace the existing Water Act and include integrated water and land use management mechanisms.

The proposed Water Resource Act should:

- ▶ Incorporate in the purpose of the Act, the Principles, Goals and Management Objectives;
 - ▶ Provide for the management of the water resource with a clear mandate for the **LEAD AGENCY**;
 - ▶ Establish provincial policies for water resource management integrated with water and land use concerns.
 - ▶ Clarify the definition of watercourse as it applies to floodplains and wetlands (see Glossary for suggested definitions);
 - ▶ Provide mechanisms for the protection of water supply watersheds and exclusion of an Injurious Affection clause;
 - ▶ Include provisions for water quality and quantity management regulation and enforcement;
 - ▶ Provide for water resource planning on a watershed basis;
 - ▶ Enable the **LEAD AGENCY** to set up and support watershed advisory groups;
 - ▶ Regulate the export of water;
 - ▶ Include arbitration mechanisms for water resource dispute resolution;
-

2.5 Water and Land Use Policies

One of the prime responsibilities of the LEAD AGENCY will be the coordination of the integration of water and land use policies to become a prime instrument of water resource management.

Provincial Water and Land Use Policies should address inter-departmental water management issues and provide effective management strategies for all resource users.

Recommendations are made in subsequent sections of the report about development of specific water and land use policies concerning storm water, erosion and sediment control, waste treatment facilities, water supply watersheds and groundwater recharge areas, other watersheds, fish and wildlife habitat, wetlands, recreation areas, and floodplains.

2.6 Other

- ▶ Undertake a comprehensive review of all provincial Acts and regulations that relate to water resources, in the context of the Principles, Goals and Management Objectives.
- ▶ Ensure that undertakings affecting the use, treatment and protection of public and private water supplies are appropriately assessed as to its environmental impact.
- ▶ Coordinate and implement "**One Stop Shopping**" for permits and approvals requiring the review by several departments, provincial and federal, in order to provide more efficient delivery of service to the public.
- ▶ Consult with municipalities and other resource users, develop a rationale for the establishment of water license and permit fees, and subject them to a reasonable review period.

- ▶ Develop and enter into Canada-Nova Scotia Water Quality and Quantity Management Agreements with Environment Canada where it is cost-effective and will assist in reaching provincial water resource management goals and objectives.
- ▶ Pursue interprovincial, national and international agreements and standards to reduce the long range transmission of airborne pollutants.

3.0 WATER QUALITY AND QUANTITY

These recommendations are intended to ensure adequate water quality and quantity for animal, plant and human use, and reduce or prevent pollution now and in the future.

The Province should:

General

- 3.1** Develop provincial water quality standards and objectives based on the *Canadian Water Quality Guidelines* and the *Guidelines for Canadian Drinking Water Quality* for water resource management in Nova Scotia.
 - 3.2** Strengthen and enforce existing environmental and water regulations and guidelines to support water quality and quantity objectives.
 - 3.3** Develop mechanisms to prioritize and fairly allocate water among different users.
 - 3.4** Assess proposed water diversions or impoundments, to meet the economic, social and environmental requirements of potential upstream and downstream users of the resource - including wetlands and wildlife.
-

Drinking Water Quality

- 3.5** Adopt a policy that will ensure the quality of drinking water delivered from public water supplies meets Provincial Water Quality Standards and Objectives.
 - 3.6** Upgrade current standards for well driller licensing and well construction to ensure that drinking water from groundwater sources is of the best possible quality.
 - 3.7** Update the assessment of groundwater aquifer quality province-wide to determine treatment requirements for existing and potential uses.
 - 3.8** Provide a comprehensive update of current and future public, private and industrial water supply demands.
-

Effluent Quality

- 3.9** Develop provincial sewage treatment standards that will improve water quality of streams, rivers and lakes and to protect the water resource, wetlands and wildlife habitat.
 - 3.10** Develop and adopt provincial effluent quality regulations for the discharge of wastewater from industry, recreation and commercial craft and waste disposal sites into fresh water and estuaries.
 - 3.11** Develop policies and procedures to help municipalities formulate and implement plans addressing pollution from combined sewer outflows and surface runoff.
 - 3.12** Develop and adopt a policy that will require owners of septic sewage disposal systems to provide adequate treatment of the effluent for the protection of groundwater and surface water resources outside their property.
-

On-site Sewage Disposal Systems

3.13 Recognize on-site disposal of waste water as a legitimate and cost-effective mechanism of water quality protection and pollution control which should be regulated and managed to ensure adequate service to individual properties and protection of the environment.

3.14 Assign responsibility for the regulation of on-site sewage disposal systems, including planning and design of new systems and maintenance and renovation of existing systems to the **LEAD AGENCY** as part of its mandate for water quality management.

3.15 Develop regulations to require periodic and regular pumping of septic tanks to ensure the proper operation and life of the on-site sewage disposal system.

3.16 Continue support for research and development to provide more cost-effective technologies for on-site waste disposal systems appropriate to the climate and hydrogeology of Nova Scotia.

3.17 Provide information to the public about the maintenance and operation of on-site sewage systems. This is needed to protect the water resource on a sustainable basis and the investment of property owners in their systems.

3.18 Encourage municipalities to recognize that waste water management districts (cluster development of on-site sewage systems) can be a cost-effective alternative to central sewage systems.

4.0 WATER RESOURCE AND LAND USE PLANNING

The recommendations in this section will serve to encourage water supply watershed management protection plans which integrate land use activities; planning and land use mechanisms to reduce and/or prevent damage from storm and flood waters and ensure that the water resource, including wetlands, is protected from the effects of erosion.

The Province should:

Water Supply: Surface Watersheds and Groundwater Recharge Areas

4.1 Adopt a Provincial policy on water and land use for municipal water supply watersheds and aquifers.

4.2 Require that within three years of adopting a policy for water supply watershed protection, plans must be developed by the municipalities who have jurisdiction. Where watersheds are in other jurisdictions, the management plans must be developed with the other municipality, with users and stakeholders.

4.3 Develop measures to protect groundwater recharge areas that serve individual wells, and management plans for groundwater recharge areas serving municipal distribution systems.

Other Watersheds and Recharge Areas

4.4 Adopt a Provincial policy on water and land use for watersheds and recharge areas other than those dedicated primarily to providing drinking water. This would provide for the development of watershed management plans, on a priority basis, that take into account:

- ▶ competing uses;
- ▶ land use activity influences on water quality;
- ▶ legitimate interests of all municipalities involved;

- role of advisory groups;
- applicable federal regulations on water quality;
- definition of roles and responsibilities for municipal, provincial and federal agencies.

Land Use Activities Affecting Water Quality

4.5 Clarify that sediment is a pollutant in the Environmental Protection Act.

4.6 Develop and adopt Provincial policies on erosion and sediment control, stormwater management, and the use of buffer zones (see Glossary). These would be applicable to development activities undertaken by private developers, government agencies, and industries. (e.g., agriculture, forestry, mining, construction)

4.7 Develop model policies and standards for surface runoff management and erosion and sediment control for the use of municipalities.

4.8 Require the preparation of erosion and sediment control plans, and stormwater drainage plans, for development activities requiring municipal or provincial review and/or permits.

4.9 Amend the *Planning Act* to be consistent with the principle of integrated water and land use management, including provisions to support the management of surface and groundwater, flood plains and wetlands in the initial conceptual planning stage of proposed developments.

4.10 Amend the *Subdivision regulations under the Planning Act* to ensure that groundwater and surface water supplies can support proposed development. This must be done in the initial conceptual planning stage of proposed developments.

Storm and Floodwaters

4.11 Develop and adopt a provincial policy for flood plain management.

4.12 Identify all flood prone areas in the province and, in collaboration with Environment Canada, complete flood plain mapping on a priority basis.

4.13 Ensure that properties mapped under the Canada-Nova Scotia Flood Damage Reduction Agreement are identified on municipal plans and are registered with the Registry of Deeds.

Wetlands

This section recommends measures for the management and protection of wetlands as a vital part of the water resource.

4.14 Develop and adopt a provincial water and land use policy for wetlands.

4.15 Continue to identify, classify, conserve and manage all wetlands, through the administration of programs that are compatible with and supported by the policies under the proposed Water Resource Act and programs under the Wildlife Act.

4.16 Monitor the development of legislation and programs affecting the management of wetlands to ensure consistency with government policy. Water resource legislation must be an effective tool in controlling the alteration, infilling, drainage and loss of wetlands, regardless of ownership.

4.17 Clarify the ownership of wetlands in order to establish a consistent and effective management policy. This may require the establishment of a special committee.

4.18 Purchase or lease wetlands that are not already crown lands, wherever possible, using the Wildlife Act Habitat Conservation Fund and federal funding contributions. Ensure the lease remains in effect if the ownership changes. Technical assistance programs, financial incentives, watershed management strategies or other means should be provided to landowners, conservation societies, municipalities, and others to conserve wetlands.

5.0 SERVICES, PRICING AND CONSERVATION

The recommendations in this section are made to ensure that municipal, provincial and other water supply and pollution control services are well planned, cost effective and promote conservation.

The Province should:

5.1 Adopt a policy requiring all municipal and provincial water utility users (domestic, commercial and industrial) to install metering systems to be sure that water charges are based on actual usage.

5.2 Adopt a pricing policy for all water utility rates based on real costs including water supply watershed (or recharge area) acquisition, planning, and environmental protection, capital and debt charges.

5.3 Adopt a policy that, where appropriate, water supply and treatment facilities be constructed and operated on a regional basis.

5.4 Require municipalities to plan for future water supply and sewage treatment facilities on a regional or joint basis in order to provide for economies of scale and the capacity to meet future needs.

5.5 Examine the role of the Commissioners of the Board of Public Utilities when considering the proposed structure of water resource management under the **LEAD AGENCY**.

5.6 Require municipalities and utilities to set up reserve funds for future and renewal infrastructure expenditures.

5.7 Examine the feasibility of introducing a policy which would give municipalities the option to levy a surcharge on municipal taxes for the management and protection of the water resources.

5.8 Ensure that a water pricing policy that promotes conservation be adopted for use by all provincial and municipal water utilities.

5.9 Ensure that municipalities do not use water utility reserve funds for other municipal projects or activities.

5.10 Require water conservation devices be installed in new housing and industry.

5.11 Establish objectives for water system losses from municipal systems.

6.0 RESEARCH, DATA AND MONITORING

The following recommendations identify the need for interdepartmental and intergovernmental cooperation, coordination and development of data bases with critical follow-up water quality and water quantity monitoring.

The Province should:

Research

6.1 Coordinate an interdepartmental examination of water management research needs and technology development that can lead to less costly and more effective water management.

Data Acquisition

6.2 Ensure that all water resource and related data are catalogued, analyzed and interpreted and made accessible to water managers and the public.

6.3 Undertake a comprehensive program to update and evaluate the information on the quality and quantity of the surface and groundwater resources of Nova Scotia.

6.4 Determine the degree of chemical and bacterial contamination of surface water and groundwater and identify preventive and/or remedial actions required.

6.5 Identify and map potential zones of saltwater intrusion into groundwater.

6.6 Undertake a comprehensive review of current and future demands for water supply as a basis for planning.

Monitoring

6.7 Review, update and rank the current needs for water quality and quantity monitoring networks throughout the province.

7.0 EDUCATION AND INFORMATION

These recommendations are aimed at developing education, communication and information programs to promote responsibility for water resource management stewardship by all Nova Scotians.

The Province should:

Education

7.1 Encourage and support educational institutions who train future water resource managers.

7.2 Ensure that the Community College system is equipped to provide training programs for trades that relate to water management, in particular water and sewage treatment plant operators.

7.3 Coordinate the development of educational materials and programs about water resources for the public school system. Encourage the study of water issues through projects and science fairs.

Information

7.4 Adopt (with a periodic review) a coordinated approach to information and education on water issues by combining the activities of different government departments and agencies concerned with water. This will require strengthening links among government, industry, university, community organizations, and the media.

7.5 Establish, through the **LEAD AGENCY**, a central clearing house for water resource information for the public (accessed through a 1-800 telephone number: 1-800-555-AQUA)

and relevant reports and documents.

7.6 Develop province-wide general information and specific media programs on water conservation and stewardship which integrate water quality management and land use activities.

7.7 Ensure technical bulletins and manuals are produced by the **LEAD AGENCY** on all aspects of water resource management. This will assist in reducing delays in obtaining approvals and permits. The publications should cover water quality standards, water testing procedures, home water treatment devices, the use of cisterns and the care and maintenance of septic systems. These should also cover the information required by government agencies for processing permits and applications related to watercourse alterations, water supply and pollution control among others.

7.8 Recognize and support community-based water conservation and protection groups and organizations for their past and future contribution to the educational process on water issues throughout the province.

8.0 OTHER

Export of Water

These recommendations should be considered as the basis for legislation for the export of water.

8.1 The export of surface water and ground-water should only be permitted provided it is surplus to the needs of the province. The sources must be identified, and the maximum withdrawal of the water resource calculated by considering the impact on the other users.

8.2 Water treatment and quality guarantees should be the sole responsibility of the licensed export permit holder.

8.3 License and royalty fees should be levied by the Province.

8.4 All water licenses should be reviewed annually.

Public Harbours

There is some doubt about the jurisdictional limits respecting freshwater and saltwater boundaries, the responsibilities for harbours, the infilling, construction of wharves and watercourse alterations in these areas. It is therefore recommended that the province:

8.5 Undertake a review of legislation covering estuaries and harbours to clarify and define the limits of provincial and federal jurisdiction.

APPENDIX I: WHAT NOVA SCOTIANS TOLD US AND WHAT THEY EXPECT

OVERVIEW

The following sections summarize Nova Scotians' concerns about water resources as presented to the Task Force during the public meetings held throughout the province. This also includes additional concerns expressed from replies received from the questionnaire in the Interim Report and from subsequent workshops. The Task Force appreciates the interest and involvement of all participants and particularly the time, the degree of detail and thought that went into the submissions received.

One or more issues or problems and their solutions or recommendations are presented in summary form as expressed by the many participants. This valuable information formed the major basic input to the Task Force in making its recommendations in Part II of the report.

I. WATER QUALITY AND QUANTITY

Many people are concerned about the basic state of the province's water resources in terms of its quantity and quality. The concerns extend to surface water and ground water, sources of natural and man-made contamination, and human interference with natural water systems. Many issues stem from human health concerns but fishing, recreational, and conservation interests are also represented.

ISSUE/PROBLEM: *Determine water quality province-wide.*

Solutions/Recommendations:

- Determine extent of natural radioactive and heavy metal contamination in N.S., e.g., uranium and arsenic.
- Classify aquifers and surface water sources by quality for humans, domestic and industrial uses.
- Investigate and determine extent of man-made groundwater and surface water pollution.

- Survey well location, type of construction and maintenance in relation to groundwater contamination.
- Provide more water-quality testing, free of charge, by Dept. of Health.
- Identify existing and projected supplies and capacities for residential use.

ISSUE/PROBLEM: *Protect groundwater and surface water from pest control products, road salt, agriculture runoff (fertilizers, manure), sewage, and petroleum spills.*

Solutions/Recommendations:

- Provide facilities for safe storage of pest control products (pesticides and herbicides).
- Provide planning mechanisms to protect groundwater and surface water.
- Do health testing to assess risk from high sodium in well water aquifers.
- Encourage use of low flush toilets for better functioning on site sewage systems.
- Rank water issues on a scientific basis.
- Sand roads in winter in critical areas to prevent well contamination from road salt.
- Establish standards to sustain high quality for groundwater in urban areas.
- Provide guidelines for every substance that ends up in our water supplies.
- Reduce level of acid rain emission by fighting problem at source (need federal, provincial, and international cooperation).
- Provide greenbelts to edge of water courses.
- Reduce industrial emissions.
- Eliminate all sources of air pollution as soon as possible to reduce water pollution.
- Locate water supply intake structures properly to avoid or reduce contamination.
- Need controls to eliminate sewage, pesticides, herbicides and road salt.
- Need "biological indicator" approach to monitoring.
- Consider rainwater as a source of supply in areas of poor water quality and quantity.
- Provide oil/dirt traps where stormwater discharges into watercourses.
- Need independent study of Boat Harbour sewage system and upgrading treatment facilities.

- Need health assessment of effects of acid rain and Boat Harbour sewage pollution.
- Recommend investigation of trihalomethanes in all chlorinated drinking water supplies in the province.
- Eliminate raw sewage entering water systems.
- Curtail flow of industrial wastes to bodies of water.
- Determination of standards to sustain water quality in urban areas a prime focus of Task Force.
- Determine quality of lakes and waterways so impact of urban development can be monitored.
- Local industry be compelled to clean up to improve salmon fishing.
- Province look at improper use of forest harvest machines on streams and other surface waters.
- Identify areas where surface waters recharge groundwater.
- Identify lakes at high risk for potential pollution.
- Need commitment for next 5 years to reduce acid rain.
- Determine impact of Department of Transportation snow and ice removal on water quality.
- Determine whether the effects of "non-point" sources of pollution, such as boating, are being addressed.
- Need to investigate effects of roadside weed spraying and contamination.
- Need to solve the problem of agriculture spills and runoff (hog manure now produced in Annapolis Valley equivalent to sewage discharge of a city of 250,000 people).

GENERAL STATEMENTS:

- Need to conserve water quality and quantity.
- Concern about acid runoff from slates and resulting fish kills.
- Clear cutting and other forestry practices along rivers are detrimental to our water systems.
- Concerned about the proximity of waste disposal sites to drinking water reservoirs.
- Concern about the chemical quality and

quantity of stormwater runoff in all municipalities.

- Inventory and cleanup existing groundwater and surface water pollution sites.
- Require that all potable water supplies meet the Canadian Drinking Water Standards and Objectives.
- Monitor groundwater and surface water to determine pollution rates to set remedial and preventive measures.
- Need to inventory existing pollution sites in order to determine where potable surface and groundwater supply sources can be obtained.
- Performance standards should be required on all permits for water uses and all discharges.
- Need definition of clean water, both in the urban and rural context. **DEFINITION:** Clean water is raw water from any source that can be safely used by humans, domestic animals and wildlife, without treatment.
- Need to adopt minimum provincial potable water quality standards.

II. WATER AND LAND USE PLANNING

Land use activities directly affect the quality and quantity of water in adjacent waterways. It is clearly recognized that disregard for this relationship has caused many of the water problems experienced around the province. The recommendations put forward by the public have implications for individuals and all three levels of government. They suggest basic changes in the way land and water are managed.

ISSUE/PROBLEM: *Not enough information and/or controls to ensure that suitable development takes place in flood prone areas.*

Solutions/Recommendations:

- Develop Provincial policy for flood plain management.
- Areas identified at risk to flooding should have mandatory registration on all property deeds.
- Provide policies and regulations to protect flood plains from inappropriate development, infilling and encroachment.
- Incorporate stormwater management planning into municipal land use planning strategies.
- More emphasis should be placed on retaining stormwater for groundwater recharge.

ISSUE/PROBLEM: *Erosion effects (such as siltation, soil loss, gully formation) deteriorate water quality.*

Solutions/Recommendations:

- Develop a provincial land use policy on erosion management and control.
- Restrict topsoil removal in areas at risk to erosion.
- Require that eroded lands caused by bad land use practice be stabilized and/or reclaimed.
- Examine and update erosion control methods and technology.
- Incorporate erosion management practices into the appropriate land and water use regulations.

- Provide effective monitoring and enforcement.

GENERAL STATEMENT:

- Soil erosion control measures are cost effective investments for agriculture and forestry.

ISSUE/PROBLEM: *Integrated land use planning systems are not in place to address water issues effectively.*

Solutions/Recommendations:

- Prepare a provincial land use policy on a broad range of land use issues that affect water.
- Province must recognize its responsibility to adopt land use policies to manage water resources effectively.
- Proposed development activities on waterways should require an environmental impact assessment to determine effects on other users.

ISSUE/PROBLEM: *Insufficient watershed management planning.*

Solutions/Recommendations:

- Ensure the integrity of Nova Scotia water quality by forming watershed management systems for local and regional areas.
- Undertake watershed planning on a province-wide basis and promote the development of inter-municipal planning strategies for watershed management and water supply.
- Establish a watershed classification system to include the link between water quality objectives and development compatible with the objectives.
- Create freshwater watershed management groups (authorities, boards, bodies, advisory groups), for each watershed including the salt water estuary where appropriate.
- Amend provincial subdivision regulations to make N.S. Environment an approving agency to ensure environmental standards are applied.
- Watershed management groups should set local objectives, guidelines and standards for water management and use in their water-

shed. These groups to have local representatives and government.

- Make comprehensive forest management plans for every water supply watershed in the province.
- Provide coordinated approvals from the appropriate government agencies for sewage disposal systems, wells, roads and storm drainage.
- Greenbelts should be encouraged and provided on Crown land and private lands adjacent to watercourses and included as part of watershed management plans.
- Provide a 100 metre buffer zone on both sides of rivers, lakes, wetlands and flood plains to protect them from development and environmental damage.
- The width of greenbelts should be determined from criteria which include the type of slope, soil and vegetative cover to minimize or reduce erosion.
- Remove the Injurious Affection clause from the Water Act.

ISSUE/PROBLEM: *New sources of water will be required.*

Solutions/Recommendations:

- The province and municipalities should determine/catalogue and acquire or control where possible existing and potential water supply lands and well fields in preparation for future municipal and industrial growth.
- Protection of groundwater resources is currently inadequate.
- Adequate monitoring of land based activities should be carried out by watershed management bodies as the result of integrated land use and water planning.
- Classify groundwater contamination as the result of 1) man's activities, 2) natural contaminants and 3) improper well construction and location.
- Future potential water requirements and sources of pollution must be identified.

ISSUE/PROBLEM: *Current approach to the management and protection of water supplies is fragmented.*

Solutions/Recommendations:

- Make the production of comprehensive management plans mandatory for all water

supply watersheds.

- Coordinate government, private sector and public input for the design, implementation and monitoring of comprehensive water supply area management plans.
- Land use practice codes/bylaws should be established for (agriculture, forestry, mining, building and road construction) to prevent adverse effects on water quality.
- Incorporate broad scope of planning tools into comprehensive management plans for critical water supply watersheds.
- Municipalities should own their water supply watersheds where possible.
- Residents and property owners within watersheds must be involved in the preparation phase of any watershed management plan.
- Land use development should be compatible with the projected use of water resources.
- Adequate monitoring of land use activities should be used to prevent adverse effects to water quality.

ISSUE/PROBLEM: *Need to ensure that drinking water remains clean and unpolluted.*

Solutions/Recommendations:

- Ownership by municipality of water supply area.
- Designation of the water supply watershed as protected water areas under the Water Resources Act, with or without regulations.
- Implementation of land use controls.
- Provide adequate water treatment.
- Comprehensive water supply watershed management plans are needed.
- Protect and maintain high quality water; a complete integrated approach to all aspects of water management must be made.

ISSUE/PROBLEM: *Not enough attention paid to protecting groundwater regime.*

Solutions/Recommendations:

- Adequate monitoring of land based activities should be carried out through a watershed authority and by using integrated land use planning.
- Classify groundwater sources into (1) high quality for human use, (2) intermediate quality for human use after treatment, industrial and

agricultural use, and (3) low quality for other uses.

- Classify groundwater contamination as the result of (1) man's activities, (2) natural toxins and (3) improper well construction and location.

- For planning purposes groundwater recharge boundary areas can be considered, in most cases, to be the same as surface water watershed boundaries.

III. WILDLIFE, WETLANDS AND RECREATION

A full range of interests must be considered to allocate water to meet the needs of different users. They include consumptive uses such as home, business and industry, and the non-consumptive uses such as recreation, hydro plants, wildlife and wetlands. In some cases the impact of one user is incompatible with the requirements of others. In these situations mechanisms are needed to resolve conflicts and ensure that sustainable use of water is protected.

ISSUE/PROBLEM: *Economic development of province depends on the sustainable use of water resources, recognizing the environmental impact on other users.*

Solutions/Recommendations:

- Recognize adverse effects of dams on upstream and downstream fish and water movement by providing adequate flows and fishways.
- Ensure that water flows from dams and river diversions are maintained for habitat management and other users.
- Proposed river diversions and dams must be evaluated on economic, social and environmental impacts, e.g., integrated resource planning.
- Develop water management principles which integrate economic development and environmental protection.

ISSUE/PROBLEM: *Water Resources must be allocated on a fair basis to competing users to protect the environment and provide economic benefits to the Province.*

Solutions/Recommendations:

- Consider incentive programmes for industry and others to conserve water.
- Need comprehensive inventories of wetlands to provide a basis for a fair allocation of the resource.
- Need holistic approach to maintain clean water.
- Must consider multiple uses of water when allocating water resources.
- Need controls for competing water users.
- Allocation of water resources must be prioritized among all users. Consultation and cooperation are necessary to arrive at a fair allocation. Once legally allocated the use must be monitored to ensure the resource is not degraded by any one user.

ISSUE/PROBLEM: *Sewage and its impact on other water users is not being recognized.*

Solutions/Recommendations:

- Sewage treatment is needed to improve water quality for streams, rivers and lakes.
- Standards must be set for the quality of the receiving water and the effluent being discharged.
- Provincial standards must be set for chemical, biological and suspended solids for sewage treatment facility discharge with deadlines for compliance.
- Consider results improved sewage treatment will have on tourist and shellfish areas.

ISSUE/PROBLEM: *Widespread pollution damage caused by soil erosion and siltation from construction sites, forest and agriculture lands on rivers, ponds, lakes, bogs and wetlands.*

Solutions/Recommendations:

- Must consider costs and impact to fish, plants, wildlife and people.
- All projects (major or small) which affect wetlands and flood plains should have environmental impact studies.
- Guidelines, standards and regulations must

be enforced to prevent environmental damage, e.g., forest clearcutting and infilling of wetland areas.

- Erosion control training programmes must be mandatory for developers and government departments. Regulations for sediment/silt runoff are required.

ISSUE/PROBLEM: *Wildlife habitat is being lost.*

Solutions/Recommendations:

- A comprehensive inventory of wildlife habitat is necessary to avoid water resource development that is incompatible.
- The present Wildlife Act covers only vertebrate species. It should be amended to also cover plants and invertebrates.
- Endangered species habitat should automatically be protected and not at Ministerial discretion.
- Must have comprehensive land use policies and plans developed using public input and education.
- Existing legislation protecting wildlife habitat and related matters must be strictly enforced, but most important is public education.
- Environmental project funding should be encouraged for fishways, wildlife habitat, river clean-up, from both the private and government sectors.
- Government should consider dedicating funds from license fees for fishing and hunting to wildlife and wetland preservation.
- Storm sewers discharging into wetlands must not contribute contaminants, such as silt, oil and sewage.
- Streamside vegetation must be present to provide fish protective cover, shade and insect food.
- Monitoring fish health factors can lead to discovery of environmental problems.
- On occasions when wildlife habitat is lost, nearby habitat should be reserved to create "No Net Loss".

IV. SERVICES, PRICING AND CONSERVATION

Sewer and water servicing is very expensive. Several municipalities are burdened by the cost and feel that funding sources are inadequate. However, there is reluctance to charge users for the full cost of providing the service and to set up funds for improvements to the system. There is also little effort to encourage water conservation, reduce waste, and share facilities for mutual benefit.

ISSUE/PROBLEM: *Funding and management of water and waste water supply and treatment facility alternatives need to be examined and upgraded.*

Solutions/Recommendations:

- Municipal water rates must reflect the real cost of supply and treatment.
- Encourage municipal units to provide joint water and sewage services on a regional basis.
- Municipalities need policies and financial aid to separate stormwater from domestic waste water.
- Funding help needed by municipalities for legal and survey costs when designating protected watersheds.
- Utilities should have rate structures that allow them to purchase watershed lands.
- Water users on central services are heavily subsidized by public funds while most rural users on individual private well supplies are not.
- Water, sewage and solid waste systems should be operated as utilities.
- Protection of water resources must be reflected in the water utility rate structure.

ISSUE/PROBLEM: *Water is not being conserved.*

Solutions/Recommendations:

- All water delivered to the customer must be metered.
- Provincial standards must be set for municipal water system losses.
- Need increased funding for water quantity measuring stations to provide efficient province-wide monitoring network.
- More active participation is required with

the federal government in the cost-shared water quantity measuring programme to provide an efficient province-wide monitoring network.

- Low flow devices such as toilets and shower heads should be mandatory on all new homes. Encourage their installation in all existing homes.
- Include climate change assessment in long range water resource planning. Carry out a risk analysis to determine costs and benefits.
- Introduce progressive pricing to promote conservation and end the present policy of paying less per unit volume of water when water usage increases.
- Use tax incentives to promote water usage conservation.

ISSUE/PROBLEM: *Municipalities have been using water utility funds for other purposes than originally intended.*

Solutions/Recommendations:

- Set up reserve funds to pay for replacement and future water supply and treatment facilities.
- Government should not allow municipalities to use surplus funds from their water utility operations for other municipal functions.

ISSUE/PROBLEM: *Current water rate charges are not realistic and should be linked to waste treatment charges.*

Solutions/Recommendations:

- Individuals should pay all costs for the use and treatment of the resource.
- The water quality discharged from treatment plants into water courses should be equal to or better than the quality of the raw water withdrawn.
- Adopt a provincial pricing policy that recognizes value of resource, cost of supplying it and disposing of it safely after it is used.
- Rural users should be encouraged to test the water quality of their own wells.
- Charge fees for sewage treatment of out-of-province pleasure boats.
- Need legislation respecting boat discharge pollution treatment on provincial inland waterways.
- Protection of water resources must be re-

flected in the water utility rate structure.

- User charges need to reflect economic value and encourage the most efficient use of the resource.
- Major projects affecting water supply and treatment should be subject to the provincial Environmental Assessment Act.
- Province needs policies for the separation of stormwater and domestic waste water which includes the appropriate financial incentives.
- Concerns for the deterioration of water supply and treatment infrastructure are valid and there must be continuing vigilance for proper operation and maintenance and financial management.
- Improved water quality can be reflected in a higher price for a better product.

V. RESEARCH, DATA AND MONITORING

The existing structure for managing water has several serious shortcomings, in particular, knowledge about the resource and how to resolve problems. This includes an incomplete data base on the quantity and quality of water in different parts of the province. Also, there is inadequate support for research and information gathering, and few trained operators for treatment plants.

ISSUE/PROBLEM: *Water Resources training at community college and university level is minimal.*

Solutions/Recommendations:

- Provide strong support to educational institutions that are training future water managers.
- Water and sewage treatment operators should be trained using the most current methods and courses. (e.g., DACOM chart type curriculum)
- Government should support research projects in the resolution of water supply and treatment problems - this in turn assists educational programmes at university level.

- Strengthen the human resources planning, development, recruitment and training to meet needs of Government.
- Coordinate existing interdepartmental and water resources engineering expertise to evaluate provincial water infrastructure and research needs.

ISSUE/PROBLEM: *Decision makers have inadequate access to interpreted research and data on water to allow for timely resolution of water resource management problems.*

Solutions/Recommendations:

- Support the Centre for Water Resources Studies at the Technical University of Nova Scotia on priority provincial water research programs.
- Develop research programmes to determine pesticide and sewage contamination of groundwater.
- Continue industry-public-government research programs.
- Research needs to be collected, analyzed and interpreted in a readily available and usable form for public use.

ISSUE/PROBLEM: *Lack of adequate water resources (hydrogeological and hydrological) data to assist in implementing appropriate water, land use policy and control measures.*

Solutions/Recommendations:

- Need for more water quality monitoring and inventory data provided on readily accessible basis, e.g., water use, radioactive and heavy mineral contamination, groundwater and surface water quality.
- Map and inventory the water resource using a geobased information system (GIS) and make it readily available to, and understandable by, the public.
- Need for more water quantity monitoring and inventory data provided on a readily accessible basis, e.g., water use and flows.
- Public libraries are considered good locations for information on water resources and this might include computerized data bases. (Also consider municipal planning agencies.)
- Monitor groundwater around farms and manure storage areas.
- Private home owners should have their

wells tested on a routine basis and the results compiled and available province-wide.

- Assess future demand for water quality and quantities province-wide.
- Provide readily available data to the public on wet and dry seasons.
- Identify and make an inventory of water pollution sources province-wide.
- Determine assimilative capacities of receiving waters downstream from sewage treatment plants and sources.
- Map and identify potential zones of salt-water intrusion into groundwater.
- Water quality testing should be carried out by accredited laboratories.
- Importance of basic water monitoring and inventory should be recognized by province in providing adequate funding to determine resource base.
- Develop and implement province-wide methods and standards for monitoring and the collection of basic data.

GENERAL STATEMENTS:

- More information should be gathered on the state of the environment.
- Information should be provided on soil erosion and the use of cover crops.
- Provide data on wet and dry seasons.
- Long-term health (epidemiological) data studies should be carried out in areas of critical concerns, e.g., Whitney Pier/Sydney areas.

VI. EDUCATION AND INFORMATION

The need for better formal and non-formal education surfaced as an important issue in the consultation sessions. There is a general sense that better or increased information would be an important step in resolving some of the current water problems. This would promote stewardship of water resources by the public.

ISSUES/PROBLEMS:

- *Public school curricula should include more about water and waste water issues.*
- *Training is required in the technical aspects of water management.*
- *The public has difficulty accessing appropriate information about water, or about contaminants which affect water.*
- *There is a need for integration of information among government departments.*
- *Residents and community organizations are not being used effectively and efficiently in the management of water resources in their areas.*
- *People generally are not fully aware of the relationship between water quality and general health. Better information and education about water contamination is required.*
- *The media has a responsibility in the educational process.*

Solutions/Recommendations:

- Students in public school systems should be encouraged to address water and waste water issues through studies and projects related to the curriculum; e.g., projects in science fairs, or through an involvement with the water management process at the local level.
- Making teachers more aware of water issues through teacher training programmes would help the education of students.
- Training programmes for supervisors and operators of water and sewage facilities should be developed and implemented

through the community colleges.

- Trades that relate to water should be identified by the appropriate provincial agencies and curricula developed for technical institutes and community colleges.
- There should be more information about the promotion of rainwater collection systems, particularly in areas of critical water supply.
- Homeowners should be encouraged to learn more about water by becoming involved in the testing, management, and consultation process.
- The public should be kept informed in readily understandable language, on a promptly delivered and regular basis, about water quality issues including standards, procedures, testing, test results and water treatment and related measures. A central One-Stop Shop with a 1-800 telephone number would greatly assist in providing effective service delivery to the public.
- There should be greater involvement of community individuals and groups in the management and monitoring of water in their jurisdictions. People or groups who undertake water quality enhancement projects should be given public recognition.
- Education and media programs for water resources management stewardship with emphasis on conservation should be developed.

GENERAL STATEMENTS

- Education as a long term goal is an important tool in protecting and managing water resources.
- Public school information programmes on water resources should also benefit parents, the general public, and communities.
- Financial support is a major concern in the educational process.
- Strengthened links among government, industry, universities, community organizations, and the media would promote the spread of information about the critical nature of water.
- The connection between what goes down the drain and what comes out of the tap is important for the public to understand.
- Teacher awareness and training in water

issues is desirable.

VII. INSTITUTIONAL ARRANGEMENTS

Many presenters pointed to the need for a full review of legislation and regulations covering water management. Several administrative gaps were identified and recommendations made for how they might be addressed. The suggestions cover the individual roles and interrelationship of different jurisdictions, and the mechanisms that could be adopted to provide effective water resource management.

ISSUE/PROBLEM: *The approach to the management of water resources in Nova Scotia is fragmented. This involves municipal, provincial and federal departments, e.g., Environment (federal and provincial), Health, Municipal Affairs, Forestry and Fisheries.*

Solutions/Recommendations:

- Jurisdictional roles are important but of secondary priority to investigating problems and gaining public support.
- Need a regional and local approach for water supply, water and waste water treatment.
- Each region requires a single sewage treatment, monitoring and enforcement authority or agency.
- Should have regional agencies or authorities responsible for setting standards, operating treatment plants, monitoring, enforcement and setting overall land/water management priorities.
- Must be coordinated and cooperative approach to water resource management among provincial departments, e.g., Environment, Fisheries, Forestry, Health and Municipal Affairs.
- Federal-provincial-municipal cooperative water resources agreements be revived and continued.
- Set up an inter-governmental agency or body for watershed management to control,

regulate and protect water on a sustainable basis, e.g., rivers, lakes, wetland and water supply areas.

- All aspects of water use must be considered in the watershed management process under a single implementing agency.
- The Water Act should be removed from the jurisdiction of the Department of the Environment, perhaps with a move towards privatization of water resource management.
- The impacts of freshwater discharges on river estuaries and coastal waters must be considered in the overall watershed management process.
- Use watershed management approach to set objectives for water quality and treatment.
- Watershed management advisory groups should not have the legal authority in decision making for development approvals.
- Conflicting federal and provincial regulatory jurisdictional responsibilities must be thoroughly studied, clearly defined and separated where possible.
- Current provincial statutes do not clearly define the role of municipal governments in the protection of water resources.
- Provide regional service centres throughout the province with knowledgeable staff to send out information on standards, guidelines and simple water quality testing procedures for the public.
- The establishment of "A One Stop Shopping Agency" for all water resources information, requirements and permits should be a top priority of the Task Force.

ISSUES/PROBLEMS:

- *Individuals have difficulty in identifying appropriate government body or agency to discuss water problems.*
- *Ambiguity exists in the Water Act and in government policy regarding wetlands.*
- *Legislation, regulation and the administration of water issues are spread over several provincial acts (Water, Environmental Protection, Fisheries, Forestry, Planning and Health Acts).*
- *Enforcement and penalties for regulations are inadequate.*

Solutions/Recommendations:

- Province-wide mechanisms are needed to protect groundwater and restrict development on wetlands.
- The supply of water is primarily a municipal responsibility.
- Regulations are needed to allocate and approve distribution and treatment costs and settle disputes over water.
- The province needs to provide municipalities with legislative authority to protect and manage watersheds outside of their municipal boundaries.
- The public should be able to get one provincial permit which addresses the water concerns of all related government agencies.
- Regulations are needed on degree of water treatment and monitoring.
- Regulations are needed to deal with existing development in flood-prone areas.
- Ban untreated waste water discharges into rivers, lakes, wetlands and floodplains.
- Incorporate road construction guidelines and controls to protect watersheds.
- Enact legislation to define public harbours in Nova Scotia (As has been done in Ontario and B.C.).
- Municipalities need support staff with their authority defined by legislation.
- Encourage voluntary approach to water resource planning and monitoring.
- Community individuals and groups should not make water management decisions but should be used to provide advice on resource issues.
- Regional river basin conservation authorities deserve consideration.
- Projects which affect water and land use with watersheds must have an environmental impact assessment. Amend Environmental Assessment Act.
- Pollution caused by negligence should be corrected by mandatory remedial measures. Amend Environmental Protection Act.
- Fish habitat should be considered within the framework of water planning and management. Communicate to the federal government that Section 31 of the Fisheries Act should have appropriate changes.
- Amend the Nova Scotia Special Places Protection Act to include watershed areas.
- Place the burden on pesticide applicators to show that pesticides/herbicides are not harmful to the environment. Amend the Nova Scotia Pest Control Products Act.
- Give municipalities power to make regulations and control erosion and sedimentation. Require N.S. Department of the

Environment to approve subdivisions. Amend the Planning Act.

- Allow municipalities to designate watersheds, make regulations and enforce them.
- Definite powers to control land use in water supply watersheds should be given to the municipality using the water.
- Define and establish the responsibilities of municipalities and the Department of the Environment with respect to water resources and water supplies.
- Clarify ambiguities in provincial government policy on ownership of wetlands.
- Limit and control forestry operations, use of herbicides and pesticides in watershed areas.
- Regulate and control erosion and sedimentation.
- Amend the Water Act to clarify the section of legislation which deals with notification, enforcement and compensation for injurious affection.
- Amend the Water Act to allow courts to order reparations.
- Define standards for the control and containment of farm waste.
- Define a provincial policy for managing stormwater drainage.
- Provide for improved standards for the construction of wells and enforcement of regulations, amend the Well Drilling Act.
- Increase maximum penalties for violations of the various Acts and regulations to deter corporate offenders.
- Adopt federal standards for construction materials used in water supply and treatment systems.
- Provide mandatory training of pesticide applicators as well as water supply and wastewater treatment plant operators.
- Legislate a new Water Act with regulations that coordinate and combine all aspects of water control now contained in other provincial statutes, e.g., Planning, Health, Fisheries, Forestry, and Municipal Acts.

GENERAL STATEMENT:

Jurisdictional problems of land use affecting the protection of the recreational capability of water needs to be addressed. The development of land surrounding water can have a profound influence on this capability which includes access to water, water quality, aesthetics and wildlife habitat. The control of private land development currently rests with the municipalities and the province has little influence over land development that impacts on the recreational use of water. To improve the situation, the province should develop recreational land use policies under the Planning Act for the use of municipal governments, to be sure that the recreational potential of the water resource, keeping in mind the rights of the private landowner.

- Research into improved databases showing areas of environmental sensitivity could be used as a decision-making tool for implementing land control measures and provincial land use policies.

ISSUES/PROBLEMS:

- *Water Managers will be scarce in the future.*
- *Training is lacking in water-related subjects at the community college and university level and must be improved.*
- *Programs to train operators of potable water and wastewater treatment plants are inadequate.*
- *Existing level of technology inadequate to provide quick and suitable interpretation of data for use by decision-makers.*

Solutions/Recommendations:

- Department of the Environment should strengthen its human resources planning, development, recruitment, training and retraining to meet projected manpower needs.
- Sound and factual water resources information is basic to the decision-making process.
- Give strong support to educational institutions that are training future water managers.
- Government support needed for research projects in water supply and treatment. This in turn supports educational programmes at the university level.
- Support is essential for the continuation of industry-public-government type programs.
- Continue and improve support for the Centre for Water Resources Studies at the Technical University of Nova Scotia.

APPENDIX II: TASK FORCE MEMBERS

CO-CHAIRS:

Anne Muecke - Douglas Carter

COORDINATION:

John F. Jones (Coordinator)
Nova Scotia Department of the Environment

Gary S. Porter (Research Assistant)
Nova Scotia Department of the Environment

MEMBERS:

James Harrison
Richard Huggard
Katharine Rice
Lester Settle
John Theakston
Joseph VanBuskirk
Donald Waller
Armand Wigglesworth

CONTACT:

If you have any questions or require additional information, please contact
Nova Scotia Department of the Environment
Minister's Task Force on Clean Water
P.O. Box 2107
Halifax, Nova Scotia
B3J 3B7
(902) 424-5206 or 424-6345
Fax No.: 424-0501

Minister's Task Force on Clean Water

Chairpersons:

Douglas Carter is the Mayor of the Town of Truro and has held this office since 1979. For the preceding 11 years he served as a Councillor, eight of which as elected Deputy Mayor. He has served on various committees including the Town Planning Advisory Committee, Truro Parks and Recreation Commission and the Colchester-East Hants Amalgamated School Board. He is also a Past President of the Union of Nova Scotia Municipalities.

Anne Muecke, Halifax, has been a partner with *Griffiths, Muecke Associates, Environmental Planning Consultants*, since 1980. Since the firm's creation she has specialized in the areas of public participation, community planning and development, watershed planning, waste management and environmental and socio-economic impact assessment. She was a member of the Halifax Harbour Task Force on Harbour Clean-up and was formerly a member of the Shubenacadie Lakes Advisory Board and Dartmouth Lakes Advisory Board.

Members:

James Harrison, Dartmouth, is retired from the position of Environmental Officer at the Dartmouth Imperial Oil Refinery. He is Chairman of the Nova Scotia Environmental Control Council, a Past President of the Dartmouth Chamber of Commerce, and a Fellow of the Chemical Institute of Canada.

Richard J. Huggard, Halifax, is the Executive Director of the Nova Scotia Department of Agriculture and Marketing. He has served as Director of both Extension Services and Livestock Services, President of the Nova Scotia Institute of Agrologists, Director and President of the Canadian Society of Animal Science, Eastern Branch and the National body, Chairman of the Advisory Council on Scientific Affairs and as President of the Agricultural Institute of Canada.

Katharine Rice, Halifax, is a consultant with the SAGE Group and holds a part-time appointment at Dalhousie University. She has had over 20 years of experience in the field of education and community development. She is Past President of the Nova Scotia Salmon Association, sits on the Boards of the Human Resource Development Association and the Atlantic Salmon Federation, and is a member of the Voluntary Planning Natural Resources Education Committee and Committee on the Environment and the Economy.

Lester Settle, Debert, has been involved in the study of rural sociology with service in four rural parishes as a United Church Minister, Rural Consultant, and Facilitator with Christian Rural Research and Resource Services and the former Executive Director of the Nova Scotia Federation of Agriculture. He has represented the Nova Scotia Federation of Agriculture on numerous committees in the province with an agriculture connection to Voluntary Planning, Agriculture, Taxation, Human Resources, Transportation and Land Resources Co-ordinating Council.

John Theakston, P. Eng., Halifax, has been Environmental Engineer in the Water Resources Branch of the Nova Scotia Department of the Environment since 1973. He has worked with various watershed management committees and advisory groups as the Liaison Member for the Department of the Environment, and on the Deputy Minister's Land Use Committee's soil conservation and water resources issue groups.

Joseph VanBuskirk, New Glasgow, is currently employed at Scott Maritimes Limited with environmental and quality responsibilities. He has held positions with other Nova Scotia Industries including Bowater Mersey Paper Company, Anil Canada Limited, Masonite Canada Limited and Ted B. Blackburn Limited. He has been a member of the Canadian Pulp and Paper Environment Improvement Committee and Air Waste Management Association.

Dr. Donald Waller, P. Eng., Halifax, is Director, Center for Water Resources Studies, and Professor of Civil Engineering, at the Technical University of Nova Scotia. His professional and research interests in the area of water resources engineering include storm water management, on-site sewage disposal, and watershed management. He is a Fellow of the Canadian Society for Civil Engineering and of the American Society of Civil Engineers, and a Diplomate of the American Academy of Environmental Engineers.

Armand F. Wigglesworth, Summerville Centre (Port Mouton), served as the first General Manager of what is now known as the Nova Scotia Department of the Environment. In 1960 he was awarded the Ross Leonard Dobbin Award, and in 1970 the Ira P. McNab Award for the operation of water systems by the Canadian section of the American Water Works Association. During World War II he served with the RCAF, where he received the British Empire Medal. He is presently Honorary Colonel of the 84th Independent Battery, RCA(M), Yarmouth. He retired in 1983 as Director of Operations for Canada, Emergency Planning Canada. He is currently President of AFW Consultants and a freelance columnist and writer.

Co-ordination:

John F. Jones, P.Eng., Chester Basin, Lun. Co. is Senior Policy Advisor to the Deputy Minister, Department of the Environment. Formerly, he was Director Water Planning and Management Division with the Department. From 1963 - 74, he was Chief Hydrologist Engineering and Groundwater Section Nova Scotia Department of Mines. He initiated the first formal groundwater resource evaluation program in Eastern Canada and also started the first graduate course in Hydrogeology at Dalhousie University. He has authored and co-authored many publications in the water resources field. In 1989 he was awarded the Canadian Water Resources Association's Distinguished Service Award for outstanding contributions to the development and management of water resources in Canada.

Gary S. Porter, Dartmouth, Research Assistant to the Task Force, is a recent graduate of the Nova Scotia College of Art and Design specializing in Environmental Planning. He has experience in municipal planning, particularly as it relates to land use, water and the environment.

APPENDIX III: DATES AND LOCATIONS OF PUBLIC MEETINGS

- | | |
|----------------------------|---|
| 1. Tuesday, April 17, 1990 | Halifax - Keddy's Hotel, Atlantic Room |
| 2. Monday, April 23 | New Glasgow Fire Hall |
| 3. Monday, April 30 | Kentville - Kings County Council Chambers |
| 4. Tuesday, May 1 | Middleton Fire Hall |
| 5. Monday, May 14 | Port Hawkesbury - Wandlyn Inn, Hawkesbury Room |
| 6. Tuesday, May 15 | Sydney City Council Chambers |
| 7. Tuesday, May 22 | Truro - Keddy's Convention Center |
| 8. Wednesday, May 23 | Amherst - Wandlyn Inn, Cumberland II Room |
| 9. Wednesday, June 13 | Yarmouth - Rodds Grand Hotel, Shelburne Room |
| 10. Thursday, June 14 | Liverpool - Lanes Privateer Inn, 1798 Dining Room |
| 11. Tuesday, June 19 | Bridgewater - Wandlyn Inn, Chart Room |
| 12. Wednesday, June 20 | Bedford - Lebrun Center |
| 13. Monday, June 25 | Musquodoboit Harbour - Gaetz Brook Junior High School |
| 14. Tuesday, June 26 | Dartmouth Library - Multipurpose Room |

DATES AND LOCATIONS OF WORKSHOPS

- | | |
|----------------------------|-----------------|
| 1. Saturday, March 2, 1991 | Truro |
| 2. Friday, March 8 | Port Hawkesbury |
| 3. Saturday, March 16 | Bridgewater |
| 4. Thursday, March 21 | Halifax |

APPENDIX IV: LIST OF PRESENTERS AND PARTICIPANTS

Don Ambler	Inland Waters Directorate, Environment Canada, Dartmouth
Jeff Amos	Bridgewater
Jim Ansems	Berwick, Kings Co.
Doug Archibald	Shubenacadie River/Grand Lake Watershed Advisory Board
Sylvester Atkinson	Mayor, Town of Middleton, Middleton
Bill Bailey	N.S. Dept. of Health & Fitness, Sydney
Candy Ballard	Antigonish
Miles Barss	City of Halifax
Maggie Bartt	La Have
Paul Batson	N.S.C.C. Institute of Technology, Halifax
Hardy Beviss	Mayor, Town of Bridgetown, Bridgetown
Dr. R.G.S. Bidwell	Atlantic Research Associates, Wallace
James Bingley	N.S. Dept. of Mines and Energy, Halifax
Mike Birtles	Sydney
Hobey Blades	East Shelburne County Rivers Assoc., Shelburne Co.
Don Breen	Scott Maritimes, New Glasgow, Pic. Co.
J. Leo Brooks	Clayton Developments Ltd., Halifax
Barry Brown	Minas Basin Pulp and Power, Hantsport
Creighton Brisco	N.S. Dept. of Environment, Halifax
Blair Brown	Liverpool
Ernie Boliver	Public Service Commission, Councillor, Bridgewater
Marsh Burgess	Halifax
Merrit Butcher	Kings County Trapper's Council, Wolfville
Gene Butt	Canadian Wildlife Association, Bridgewater
Maggie Butt	La Have
Bill Calvert	Margaree Valley
Lynda Calvert	Margaree Valley
Andy Cameron	N.S. Dept. of Environment, Halifax
David Carmichael	Town of Windsor, Windsor
Peter Casey	N.S. Dept. of Health and Fitness, Halifax
Merle V. Chisholm	Lindsay - Ecowater, Halifax
Robert Christie	Citizens Against Pollution, Pictou, Pictou Co.
City of Halifax	City Council of Halifax, Halifax
Norval Collins	Community Planning Association of Canada, Halifax
Jeff Conrad	Aquaculture Association of Nova Scotia, Halifax
Scott Cook	Kings County Wildlife Association, Wolfville
Diane Coombs	Councillor, Municipality of the County of Queens
Ed Colp	N.S. Dept. of Transportation and Communications, Halifax
Raymond P. Cote	Dalhousie Univ., Resource & Environment Studies, Halifax
Doug Cox	Bridgewater
Boyd R. Crouse	County Fed. of Agriculture, Lunenburg
Frank Cruickshanks	Inland Waters Directorate, Environment Canada, Dartmouth
Mary Daley	Mayor, Town of Westville, Westville, Pictou Co.
Dave Darrow	N.S. Dept. of Municipal Affairs, Halifax
Floyd Day	Eastern Shore Wilderness Association, Tangier, Halifax Co.
Barry Diamond	N.S. Dept. of Lands and Forests, Kentville
Blaise Dobbin	N.S. Dept. of Environment, Youth Corps, Port Hawkesbury
W. Dobson	Mill Village, Queens County
Jim Donovan	Municipality of the County of Halifax

Derek Doyle	Manitoba Dept. of Natural Resources, Winnipeg
Tony Duke	N.S. Dept. of Lands and Forests, Truro
Derm English	Nova Scotia Federation of Agriculture
Catherine Enright	N.S. Dept. of Fisheries, Halifax
Andrew Faulkner	Municipality of the County of Queens, Liverpool
Frank Fawson	Halifax
Steve Fenety	Inland Waters Directorate, Environment Canada, Dartmouth
Harry Ferguson	Councillor, Municipality of the County of Pictou, Pictou Co.
Doug Foster	Municipality of County of Cape Breton, Sydney
Russell Fougere	City of Dartmouth, Dartmouth
Knowle Francis	Chief, Afton Band, Afton, Pictou County
Roddy Francis	Chief, Pictou Landing Indian Reserve, Pictou County
Peter Gallant	Munic. of Annapolis County, Annapolis Royal
Bill Gates	General Manager, Halifax Water Commission, Halifax
David Glover	Tusket River Environmental Protection Assoc., Tusket River
Jim Goit	N.S. Dept. of Agriculture and Marketing, Truro
John F. Goudy	National Safety Associates, Yarmouth
Peter Gouthrou	Sydney
Andy Gillis	Mirror and Examiner, Middleton
Dave Gilroy	Clerk Treasurer, Town of Truro, Truro
Allan Glover	Ducks Unlimited, Amherst
Dan Graham	N.S. Dept. of Lands and Forests, Halifax
Kate Graves	Halifax
Shae Griffiths	Clean Annapolis River Project, Middleton
David Gruchy	Town of Truro, Truro
Judy Guernsey	Brookside Homeowners Association, Brookside, Halifax Co.
Krista Harding	Treasurer, Town of Liverpool, Liverpool
Bill Hart	Technical University of Nova Scotia, Halifax
Dean Hart	N.S. Dept. of Environment, Port Hawkesbury
Gordon Helm	Cumberland Co. Development Authority, Amherst
John Higgins	N.S. Dept. of Agriculture and Marketing, Truro
Jude Hirsch	Acadia University, Wolfville
Brad Hodgins	Municipality of the District of East Hants, Shubenacadie
Larry Honey	Town of Kentville, Kentville
D.A. Howard	D.A. Howard Consultants, Halifax
Christopher C. Huck	Halifax
Carol Hyslop	Valley Environmental Protection Association, Bedford
Martin Janowitz	Clean Nova Scotia Foundation, Halifax
Jens Jenson	Cumberland District Planning Commission, Amherst
Bruce Johnson	Lake Major Watershed Advisory Board, Lake Major, Hfx Co.
W.C. Johnston	Mahone Bay, Lunenburg County
John Jones	Canada-N.S. Flood Damage Reduction Program, NSDOE, Halifax
Wilf Kaiser	N.S. Dept. of Environment, Port Hawkesbury
Steve Kirincich	Councillor, Town of Stellarton, Stellarton, Pictou Co.
Walter J. Kontak	Voluntary Planning, Halifax
Jack Kyte	Scott Maritimes, Abercrombie, Pictou Co.
Lee Lewis	Lake Major Watershed Advisory Board, Dartmouth
Michael Langman	N.S. Dept. of Agriculture and Marketing, Truro
Ron Lane	Mayor, Town of Liverpool, Liverpool, Queens Co.
Victor Lee	Canexel, East River, Lunenburg Co.
Chang Lin	N.S. Dept. of the Environment, Halifax

Gerald Livingston
 Richard Lord
 Sue Loring
 Bob Luxemborg
 Janet Lyon
 Joe MacCarthy
 Robert MacCharles
 Kevin MacDonald
 Ed MacDonald
 Ed MacDonald
 Jamie MacDonald
 Sean MacDonnell
 A.J. MacDougall
 Gary MacIsaac
 Fergie MacKay
 Doug MacLean
 Margaret MacLean
 Lincoln MacLeod
 Paul MacNeil
 S. MacNight
 Terrance MacPherson
 Shalom Mandaville
 Audrey Manzer
 Bruno Marccochio
 A. Maroun
 Lawrence Mawhinney
 Michael McAdam
 Mike McGill
 Curtis McIntyre
 James McKenzie
 Pat McKenzie Porter
 Lynda McLean
 Lance Makmillan
 Bill MacWilliam
 Richard Melster
 Richard Michaud
 Denis Moerman
 Pat Monk
 Andy Montgomery
 George Moore
 David Morantz
 Murray Morash
 Catriona Moir
 Angus Murphy
 Danny Murray
 Jim Mustard
 Peter A. Nelson
 Andy Nicholas
 Henk Niesten
 Mil Nickerson
 Ken O'Brien

Port Hawkesbury
 Bridgewater Public Service Commission, Bridgewater
 N.S. Council, Girl Guides of Canada, Enfield
 Tusket River Environmental Protection Agency, Yarmouth Co.
 Shelburne Municipal Council, Lockeport
 Halifax Water Commission, Halifax
 Morrison Beatty Consultants, Sydney
 City of Sydney, Sydney
 Nova Scotia Division of Canadian Manufacturers
 Warden, Mun. of the County of Inverness, Port Hood
 Nova Scotia Well Drillers Association, Sydney
 Councillor, Town of New Glasgow, New Glasgow
 Councillor, Mun. Co. of Inverness, Port Hood
 Clerk Treasurer, Town of Mulgrave, Mulgrave
 Town of Trenton
 Halifax Water Commission, Halifax
 Wycocomagh Development Commission, Wycocomagh
 N.S. Dept. of Fisheries, Halifax
 Town of Kentville, Kentville
 Land and Sea Environmental Consultants, Dartmouth
 N.S. Dept. of Environment, Sydney
 Dartmouth
 Dartmouth Lakes Advisory Board, Dartmouth
 C.B. Coalition for Environmental Protection, Sydney
 University College of Cape Breton, Sydney
 Mayor, Town of Lunenburg, Lunenburg
 Cobequid Salmon Association, Truro
 Town of Truro, Truro
 Halifax
 Halifax
 Lighthouse Publishing, Bridgewater
 Brookfield
 Caledonia, Queens Co.
 Councillor, Mun. of the Co. of Pictou, East River, Pic. Co.
 N.S. Dept. of Lands and Forests, Halifax
 N.S. Dept. of Lands and Forests, Truro
 N.S. Dept. of Agriculture and Marketing, Truro
 Halifax Water Commission, Pockwock
 N.S. Deputy Minister's Land Use Policy Committee, Halifax
 Councillor, Town of Middleton, Middleton
 Department of Fisheries and Oceans Canada, Halifax
 N.S. Dept. of Transportation and Communications, Halifax
 N.S. Dept. of Municipal Affairs, Halifax
 Eastern Shore Wilderness Assoc. Tangier, Halifax Co.
 N.S. Department of Mines and Energy, Halifax
 Piper's Glen, S.W. Margaree, Inverness Co.
 Town of Truro, Truro
 Confederacy of Mainland Micmacs, Truro
 Cape Breton Fed. of Agriculture, Bras D'Or
 Tusket River Environmental Protection Association
 N.S. Dept. of Transportation & Communications, Halifax

Brook M. Oland	Eco Sense, Baddeck
Andrew Paton	N.S. Dept. of Municipal Affairs, Halifax
Ron Patterson	Town of Amherst, Amherst
Gwen Phillips	Councillor, Town of Wolfville, Wolfville
Armand Pinard	Deputy Minister, N.S. Dept. of Environment, Halifax
Andy Pittman	Sydney, C.B.
Ben Pittman	Town of Amherst, Amherst
Gerald Porter	N.S. Dept. of Environment, Halifax
Diane Powell	Wentworth Valley Env. Protection Assoc., Wentworth
Jim Purdy	Tusket River Environmental Protection Assoc. Yarmouth Co.
Carl Purcell	Nova Scotia Salmon Association, Halifax
Gary Rankin	Clerk Treasurer, Town of Westville, Westville
Walter Reagan	Sackville Rivers Association, Bedford
K.L. Redden	Municipality of Kings County, Kentville
Don Reid	N.S. Dept. of Health and Fitness, Truro
Haldane Reynolds	Councillor, Town of Truro, Truro
Gary Rice	Nova Scotia Power Corporation, Halifax
Bill Richards	Environment Canada - Atmospheric Environment Service
Joan Ridday	Kings Environmental Group, Wolfville
Christine Ritchie	Halifax
R.A. Robertson	N.S. Board of Public Utilities Commissioner, Halifax
Hugh Ross	Stora Forest Industries, Port Hawkesbury
Robert Rowe	Aylesford, Kings County
Paul Rudderham	Rudderham's Well Drilling, Sydney
Jack Rudolph	Truro
Basil Ryan	Councillor, Town of Mulgrave, Mulgrave
Barry Sabean	N.S. Dept. of Lands and Forests, Kentville
Conrad Sarty	Dartmouth Water Utility, City of Dartmouth, Dartmouth
Bill Saunders	Chairman, Petite Riviere Watershed Advisory Group, Bridgewater
Peter Shacklock	Portuguese Cove, Halifax Co.
Gordon Silver	Truro
Kenny Silver	Nova Scotia Salmon Association, Halifax
Margaret A. Silver	Truro
Ron Simpson	N.S. Dept. of Municipal Affairs, Halifax
Graham Smith	Brookside Homeowners Association, Brookside, Halifax Co.
Tim Smith	School for Resource and Environmental Studies, Halifax
Raymond Snair	N.S. Dept. of Transportation and Communications, Halifax
Horst Soehl	Cloverdale, Colchester County
D.M. Soulis	Sec. Wycocomagh Development Com., Whycomomagh
Anna Steele	Marion Bridge, Cape Breton Co.
Walter Stevens	Councillor, Town of Windsor, Windsor
Vera B. Stone	Girl Guides of Canada, Halifax
Roger Sturtevant	Annapolis Dist. Planning Commission
Jim Sunderland	Bridgewater
John Swim	East Shelburne County Rivers Assoc., Shelburne Co.
Tom Taylor	Annapolis Valley Affiliated Boards of Trade, Middleton
Lou Thomas	Bridgewater, Lunenburg Co.
Rob Tiarks	Bridgewater
Bill Thurston	Vaughan Eng. Associates Ltd., Yarmouth
Ian Travers	Environment Protection Serv., Environment Canada, Halifax
Roy Turner	Town of Liverpool, Liverpool

Stanley Vachal
Tom Van Milligen
Neil Van Nostrand
Eugene Veniotte
John Veniot
Jim Vollmershausen
Jack Von Roestel
Grant Walker
M. Ward
Stephen Ward
Walton Watt
Anthony Weagle
James M. Wheelhouse
Brenda White
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Ken Wilkinson
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John Woods
Harlan Wyand

Town of Trenton, Trenton
Pork Nova Scotia, Bridgewater
Port Williams
N.S. Well Drilling Advisory Board, Northfield, Lun. Co.
Canadian Manufacturers Association, Halifax
Environment Canada, Dir. Gen. Atlantic Region, Halifax
N.S. Dept. of Agriculture and Marketing, Kentville
Atlantic Business Council on the Environment, Bedford
Halifax
Molega Lake Residents Association, Bridgewater
Dept. of Fisheries and Oceans Canada, Halifax
South Brookfield, Queens Co.
Town of Digby, Digby
Sydney Well Drilling Company, Sydney
Port Mouton, Queens Co.
Municipality of Queens, Queens County
N.S. Deputy Minister's Land Use Policy Committee, Halifax
Councillor, City of Dartmouth
Bridgewater Public Service Commission, Bridgewater

GLOSSARY

ACID DRAINAGE

A process which occurs naturally or can be man induced by the interaction of acidic compounds in water with vegetation, soil and bedrock (slate), resulting in acid runoff which can alter the chemical quality in a receiving body of water.

ACID RAIN

Rain water that has been contaminated with chemicals introduced into the atmosphere through industrial, automobile, and other emissions causing the acidity to be increased from that of unaffected rain water.

AQUIFER

Earth materials (rocks, sand, gravel) that transmit enough water to supply a well or spring.

BUFFER ZONE

A buffer zone (often called a green belt) is a variable width of land adjacent to watercourses and wetlands, established to protect water from adjacent land uses. The criteria used to determine the width and type of vegetative cover for the buffer zone will be based on the soil, geology, slope and sensitivity of the water and the proposed use of the adjacent land.

CLEAN WATER

Clean water is water from any source that can be safely used by humans, domestic animals and wildlife.

FLOODPLAIN

The relatively flat or lowland area adjoining a river, stream, watercourse, lake, ocean, or other body of standing water, which has been or may be covered temporarily with floodwater during storms of specified frequency.

GROUNDWATER

All subsurface or underground water that is distinct from surface water. Usually, groundwater is obtained from a well or spring.

HYDROGEOLOGY

The science that deals with subsurface waters and related geologic aspects of surface waters.

HYDROLOGY

The science that relates to the study of the water of the earth, including its environmental and economic aspects.

PEST

Any plant, animal, or organic function of a plant or animal which may be noxious, injurious, or troublesome.

PEST CONTROL PRODUCT

Any substance or mixture of substances which directly or indirectly prevent, destroy, repel or mitigate the damage caused by any pest.

STORMWATER

Water which runs off the land during and after rainfall.

TRIHALOMETHANES

Organic compounds occurring in water as a reaction to the use of chlorine for disinfection. The guidelines for Canadian Drinking Water Quality specify maximum allowable concentrations of trihalomethanes, however most Canadian drinking water supplies contain negligible amounts of the substances.

WASTEWATER

Industrial, municipal, and domestic effluent which includes sewage, wash water, and process water.

WATERCOURSE

A natural, well defined channel produced entirely or in part by intermittent or continuously flowing water.

WATERSHED

The area drained by, or contributing water to a stream, lake, or other body of water.

WATERSHED MANAGEMENT

Administration and control of all of the resources in a watershed for the production of water, including the control of water quality, stream flow, and floods.

WETLANDS

Wetlands can be defined as an area of land which is covered by water for part or all of the year. They may be associated with rivers, lakes, streams or coastal habitats. The types of wetlands usually described are marshes (fresh or saltwater), bogs, fens, swamps, sloughs and ponds. Wetlands have the ability to provide an improvement to water quality, preserve water quantity or moderate a flood event and provide wildlife habitat.

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